

WASHINGTON

SCIENCE TRENDS

HIGHLIGHTS

SPECIAL REPORT

TRENDS
IN
DEFENSE
TECHNOLOGY

Volume VI, No. 13

June 12, 1961

* TRENDS IN MILITARY TECHNOLOGY -- A Special Report

Here is a selected digest of trends in military technology based upon information newly released by the military services and the Committee on Appropriations, Subcommittee on Department of Defense, U. S. House of Representatives, Washington 25, D. C. in hearings on Research, Development, Test and Evaluation budget proposals for the Fiscal Year which begins July 1, 1961.

* ARMY SURVEILLANCE DRONES -- The Army is investigating the feasibility of employing high altitude unmanned aerial vehicles for the purpose of wide-area surveillance. These unmanned aerial surveillance systems are expected to provide an effective combat intelligence capability for the Army in air defense environments where manned aircraft could not survive.

The Army's current research and development effort has, as one of its primary objectives, the providing of unmanned aerial surveillance systems capable of field employment at all major tactical command echelons, field army, corps and divisions.

The SD-2 drone is designed for surveillance of the enemy area of concern to the Division Commander.

The SD-5 provides the more extensive coverage required by the corps and field army commanders. Flying at treetop altitudes in order to avoid detection, and at slightly subsonic speeds, the SD-5 can adequately cover a field army's area of influence which extends some 300 miles into enemy territory. At higher altitudes, such as 40,000 feet, where its jet engine is more efficient, the SD-5 has a range of over 1,000 miles.

Transmission of surveillance information from a drone in flight is presently dependent upon line-of-sight conditions and therefore is limited in range. However, an airborne relay capability is planned which will provide real-time transmission of information from a drone in flight out to the maximum range of drone employment. Such real-time transmission will provide for immediate use of the intelligence collected over enemy territory.

* CBR RESEARCH -- The Chemical Corps Study Requirements Program has generated increased interest from industry, universities and research organizations. The program was introduced to "outside" agencies at a conference in Washington during the Summer of 1960 at which representatives of 300 organizations were present. More than 2,000 expressions of interest were received following the conference. At the present time, some 200 proposals from 70 organizations and institutions are being evaluated by the Army Chemical Corps Research and Development Command.

* TRIDENT -- A large ocean area shore-based surveillance research program. Further details censored.

(Continued)

MILITARY TECHNOLOGY (Continued)

* FUTURE ARMY RIFLE -- Development of an individual Army weapon of the future will be directed toward combining the point target capability of the rifle with the high explosive area fire capability of the 40-millimeter grenade launcher "Thus significantly increasing casualty producing effect per pound of combat load."

* ARMY RESEARCH FUNDS -- Approximately one-half the funds for Army research and development are allocated to four missile and space programs. These are Nike Zeus, an anti-missile-missile; Advent, a global communications project utilizing space vehicles as relay stations; Pershing, a missile program and Mauler, a mobile antimissile and antiaircraft defense system for the field, which may also be stationed in Europe for point defense of cities. Much of the remaining half of the Army's research funds -- perhaps \$300 million -- is in inhouse personnel, overhead and fixed charges.

* NIKE ZEUS -- Defense Secretary McNamara refused to permit Army representatives in his office when spokesmen for Bell Telephone Laboratories, at his request, delivered a briefing on the progress of the Nike Zeus system.

* PERSHING PROGRAM -- The Army states that it would be unwise to stop the development of the Pershing missile, which is designed as a followon to the currently employed Redstone. The Army specifically states that neither the so-called "Missile A" or "Missile B" currently under development could supply the required range for the support of the field Army.

* Missile "A" is being designed as a division direct support system; its range will be compatible with the fire support requirements for that unit. Missile "B" will be for general support of the division and will have a range to meet this fire support requirement.

* DEFOLIATING AGENT -- The Chemical Corps is attempting to develop improved defoliating agents, which, dropped in a densely wooded or jungle area, would cause foliage to drop off plants and trees. The principle has been effectively demonstrated, but it now takes some two to three days for the chemicals to take effect.

* ARM PROGRAM -- Navy officials state that test results to date have been very promising in the small, lightweight, relatively inexpensive Anti-radiation Missile (ARM), an air-to-air guided missile presumably designed to destroy radars and other radiation sources.

* ASH PROGRAM -- The Marine Corps' assault support helicopter (ASH) is designed to provide support aircraft to replenish obsolescent World War II and Korea observation aircraft now in inventory. Replacement aircraft are required by Fiscal Year 1963. The ASH will carry out one of the fundamental missions of Marine aviation -- observation and reconnaissance of the immediate battlefield area. Navy officials believe that at present the quickest and most economical program appears to be the modification of an existing light helicopter or a new minimum-cost development using off-the-shelf engines and proven airframe components.

* MADRE SYSTEM -- This is a joint Navy-Air Force program aimed at development of VHF/UHF radar for over-the-horizon detection of aircraft and missiles. A full-scale development model is under construction.

* NEW EXPLOSIVE -- The Navy, at Inyokern, Calif. is developing a new explosive which may be ready to go out by contract to industry at the end of 1962 or 1963. The chemistry problem "is pretty well known." Officials state "it is really a packaging problem, mechanical engineering, and how do you make this thing actually work. We have known for years that you can make this sort of an explosion."

MILITARY TECHNOLOGY (Continued)

* TYPHON SYSTEM -- The Navy describes the Typhon system as its principle development effort in ship-launched surface-to-air missiles. This system involves a long-range surface-to-air missile and a new type radar which permits simultaneous firings at multiple targets while at the same time providing the search functions for the ship. This single new radar eliminates approximately 13 radars currently installed on guided missile ships. The Typhon system, capable of operating in a heavy electronic countermeasure environment, will control both a medium range and a long-range missile with interchangeable nuclear and high explosive warheads and a surface-to-surface capability.

* SATS -- A short airfield tactical system developed with Marine launching and arresting gear, and designed to accommodate all existing Navy and Marine aircraft. A catapult or JATO system will be required for takeoff. Runway length is reduced to 2,000 feet. One such system has been assembled and installed in 60 hours.

* GLADEYE -- A Navy container for dropping large quantities of World War II bombs from jet aircraft. Part of a broad program to utilize and modernize the stockpile inventory of weapons.

* 115-MM BOOSTED ROCKET -- A close support artillery weapon under development as a replacement for the much heavier 105-mm Howitzer. Main development is being carried out by Armour Research Foundation, Chicago, Ill., in conjunction with several Army arsenals. The technique of combining a rocket with a conventional projectile and firing from a gun tube in a normal manner is said to offer many advantages. Much lower chamber pressures can be explored since the rocket will become the main propulsive force. This means lighter gun barrels, recoil mechanisms and mounts. Advantages are greatly increased range, considerably smaller, lighter and more mobile weapons, which in turn permit smaller, lighter, more versatile prime movers.

* MARINE SWAMP VEHICLES -- An interesting possibility for an all-terrain swamp vehicle has resulted from an Office of Naval Research contract. The vehicle has a system of wheels or rollers attached to a track so that the undercarriage or sponson rests on and rolls across the top of the wheels as they roll on the ground. Thus, the vehicle moves at twice the speed of the track on solid ground. A test bed has demonstrated a "remarkable ability" to negotiate all types of terrain. When in mud or swampland, due to the increased torque demand, the wheels slide against the undercarriage and do not roll, but act as grousers. This results in the slowing down of the vehicle to the same speed as the track.

* TV GUIDANCE -- The Navy is showing renewed interest in television guidance in which a television camera is placed in the nose of an air launched missile. The pilot sees the picture and guides the missile to the target by command guidance.

* NEW LOCKHEED HELICOPTER -- Navy officials credit the Lockheed Corp. with "one of the outstanding research jobs in the helicopter field...the first real step forward in the helicopter business" in cost-cutting, reduced maintenance, improved reliability and training ease. The concept, developed at company expense features a rigid rotor system using a gyroscopic principle to achieve a high degree of stability previously unknown to helicopter flight. A test bed aircraft has been flown successfully for many hours during the past year. Serious consideration is being given to establishing a mutually funded Army-Navy development project with Lockheed which, if successful, could result in an operational military aircraft by January, 1964.

Vice Admiral John T. Hayward states: "A lot of people think Lockheed gets things done--their reputation is something. They do a fine technical job. This is just one example of the fine technical job they do."

MILITARY TECHNOLOGY (Continued)

* BAMBI -- Described as a project to explore the possibility of intercepting a missile as it is launched by means of space interceptors. Officials state that "Examining this concept now the conclusion we come to is that it is not sufficiently fantastic to drop it. There is enough scientific merit to look into this more carefully...The probability of its working is much smaller than other programs being pursued."

* UNIVERSITY MATERIALS RESEARCH -- The Advanced Research Projects Agency is currently supporting Materials Research Laboratories at Cornell, Northwestern and Pennsylvania Universities, with plans to include five or six additional institutions in the Fiscal 1961 program. Proposals have come from Harvard, Yale, Brown, Chicago, Case, Stanford, North Carolina and a combined group of Rocky Mountain universities, among others. Originally, 54 proposals were submitted. Plans for this program in Fiscal 1962 are "still not clear (because) there is an issue as to the wisdom of how quickly to proceed, whether it is good to contract for all at once or perhaps spread the initiation of the contracts over a little more time."

* DEATH RAY -- Officials state that "at the present the possibility of developing a death ray using electromagnetic energy seems remote." High power transmitters being developed for the Advanced Research Projects Agency, are part of a superpowered radar program and are not for destruction purposes. "If there is a new technique developed we would be interested in following through to the point of seeing whether it was feasible."

* DROMEDARY -- Serious thought is being given to this concept in which a low performance aircraft stays on patrol for 2 days or more, armed with missiles of the Skybolt type, or still more advanced, an air-launched ballistic missile with stellar inertial guidance and a nuclear warhead. A turboprop aircraft would probably be employed, using a system of boundary layer control -- probably applied to the wings and to the tail surface. Such a system is being developed by the Northrop Corp. as laminar flow control, in which the passing air is literally sucked through the wing. "Theoretically it has a lot of promise. Practically, we have worried about it because we do not know what ice, fog, snow or dirt might do to these pinholes." Should the system prove feasible and operationally advisable, a Dromedary program might result. An aircraft of this size could also carry a very powerful radar system and air-to-air missiles, and could possibly be employed for tactical control of airspace in combat, as well as a strategic missile platform.

* ARMY BASIC RESEARCH -- The Army currently has 400 colleges, universities and other research organizations participating in its \$50 million basic research budget, which is about 5 percent of the total Army budget. Army officials believe that the total should be increased to 6 or 7 percent. However, projects where "time and events" have overtaken potential usefulness will be dropped -- as 183 have been dropped in the past 30 months.

* SAMOS -- The Air Force is requesting \$276 million for this program in Fiscal 1962. The money goes toward development of a polar orbit earth satellite reconnaissance system. All further information is censored.

* PENETRATION AIDS -- The Air Force is requesting \$35 million for the development of devices and techniques to assure the survival of ballistic missiles from launch to warhead detonation. The program at present includes midcourse and terminal area penetration aids. New reentry vehicles of low radar cross section, and advanced decoys which will simulate the reentry vehicle and incorporate other confusion devices are planned.

* MIDAS -- Air Force research funds for this missile defense alarm system incorporating infrared detecting satellites increase to \$201 million in 1962, compared to 107.4 million in the current Fiscal Year. Most other details are censored.

MILITARY TECHNOLOGY (Continued)

* AIRBORNE SWITCHING STATION -- This is an Air Force development program, both for communications and in anticipation of enemy countermeasures. Development of equipment will begin in Fiscal 1962, and it is estimated that it will take approximately 2 years to complete development and test.

* NEW SIDEWINDER MISSILE -- The Navy has allocated close to \$2.7 million in Fiscal 1962 to development of Sidewinder 1-C, an improved version air-to-air missile. The Navy lists the following "limitations" of the 1-A:

✓ Sidewinder 1-A is a passive, infrared homing missile. This means that it will home in on a target's infrared heat. Since infrared heat is diffused by clouds and rain, Sidewinder 1-A cannot be used effectively in these weather conditions.

✓ Under most conditions the interceptor carrying 1-A must be maneuvered into a position behind the target before firing because there is usually an inadequate amount of infrared heat being emitted from the target from other aspects.

✓ 1-A is limited to speed. This speed limitation is such that modern interceptors cannot exploit their full speed capabilities while carrying 1-A. In other words, high speed modern interceptors must restrict their speed in order to employ this missile.

✓ 1-A is limited to an altitude which is below the altitude of the contemplated threat.

✓ 1-A has been used successfully against the (Chinese) Communists. For this reason, and because the Communists understand the principle of 1-A it is possible that they have developed or are developing countermeasures.

* NOISELESS VEHICLES -- The Army believes that the possible development of a noiseless vehicle depends on the development of a fuel cell to replace the conventional internal combustion engine. Such a fuel cell must use a very inexpensive, readily available liquid fuel such as some petroleum product or a product which could be readily made from petroleum, and employing air as the oxidizing medium.

The device must be able to start at or near ambient temperatures. The incorporation of a fuel cell into a vehicle (a personnel carrier) is being considered by the Army, not because the fuel cell is now considered practical but because this will allow necessary engineering studies to be undertaken for replacement of a combustion engine, in anticipation of the hope that such a fuel cell will later prove practical.

A noiseless powerplant of this kind is also expected to have one or more of the following equally important advantages:

✓ Low temperature of operation that will make it difficult to detect by infrared radiation.

✓ No noxious exhaust products, so that it can be operated in confined spaces.

✓ Higher fuel efficiency so that logistics problems would be eased.

✓ Distribution of parts of the powerplant over different parts of the vehicle to improve its silhouette as well as making it less vulnerable in case of loss of part of the fuel cell battery.

✓ Possibility of using a variety of fuels, thus making it less dependent on specific kinds of fuels.

Note: Development of better electric motors and electric controls would also be needed to optimize such silent power systems.

P U B L I C A T I O N C H E C K L I S T

- LUNAR POWER PLANT, a detailed Argonne National Laboratory report on an ultra-compact, direct-cycle fast reactor to supply electrical energy for human expeditions on the Moon. Also suggests areas of research which would aid in making such a unit feasible. 137 Pages. (Report ANL 6261 available through AEC channels or at \$2.50 from OTS, U. S. Department of Commerce, Washington 25, D. C.)
- INFORMATION RETRIEVAL FOR CHEMICAL PROCESSES, a technical report aimed toward development of a system for locating information with respect to the chemical changes which occur in the transformation of one chemical compound to another. The approach is to isolate the sites of reaction in reactants and products as the basic units of information. 42 Pages. (Patent Office Research and Development Report No. 20 available at 25 cents from Publications Office, U. S. Department of Commerce, Washington 25, D. C.)
- ALLOY DEVELOPMENTS, a summary of recent significant developments in the field of nickel-base and cobalt-base alloys and high-strength superalloys. 4 Pages. (DMIC Memorandum No. 104 available to Government agencies, contractors, sub-contractors and their suppliers from Defense Metals Information Center, Battelle Memorial Institute, Columbus 1, Ohio)
- MANAGEMENT COURSE GUIDE, a guidebook designed to help in the planning, organizing and execution of administrative management courses which are co-sponsored by the Small Business Administration. 102 Pages. (Available to educators at regional SBA offices or from Management Development Division, Small Business Administration, Washington 25, D. C. Ask for "Planning and Coordinating Administrative Management Courses")
- FAN-IN-FUSELAGE AIRCRAFT, a report on wind tunnel tests of a large-scale model of a proposed vertical take-off and landing (VTOL) aircraft with a high disk-loading fan mounted in a deep fuselage duct. The fan and fan drive system used were the convertible lift-thrust engine system components built by General Electric. 14 Pages. Single Copies Free. (Write National Aeronautics and Space Administration, 1520 H Street, N. W., Washington 25, D. C., ATTN: CODE BID, for NASA Technical Note D-789)
- AERIAL PHOTOGRAPHS IN GEOLOGIC INTERPRETATION AND MAPPING, a guide to the uses of photogeology and various photogeologic procedures, interpretation and instrumentation. Includes many illustrations and an extensive literature list. 230 Pages. \$2. (Write Superintendent of Documents, Government Printing Office, Washington 25, D. C. for Publication No. I 19.16:373)
- HANDBOOK OF FIBROUS MATERIALS, a consolidated work in various phases of basic design data, friction, abrasion, weather resistance, etc. of different yarns, cords, webbings, and fibrous materials. 495 Pages. (WADD TR 60-584 ((PB 171 494)) available through military channels or at \$6 from OTS, U. S. Department of Commerce, Washington 25, D. C.)
- MAGNETO-FLUID DYNAMICS, the proceedings of an international symposium held at Williamsburg, Va. and Washington, D. C. in January 1960. Reprinted from "Reviews of Modern Physics, October 1960". 1032 Pages. \$4. (Write Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Avenue, N. W., Washington 25, D. C. for NAS Publication No. 829)

